Class 9: Halloween Candy Mini Project

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Here we analyze a candy dataset from the 538 website. This is a CSV file from their Github repository.

Data Import

```
candy <- read.csv("candy-data.csv",row.names = 1)
candy
```

	chocolate	fruity	caramel	peanutyalmondy	nougat
100 Grand	1	0	1	0	0
3 Musketeers	1	0	0	0	1
One dime	0	0	0	0	0
One quarter	0	0	0	0	0
Air Heads	0	1	0	0	0
Almond Joy	1	0	0	1	0
Baby Ruth	1	0	1	1	1
Boston Baked Beans	0	0	0	1	0
Candy Corn	0	0	0	0	0
Caramel Apple Pops	0	1	1	0	0
Charleston Chew	1	0	0	0	1
Chewey Lemonhead Fruit Mix	0	1	0	0	0
Chiclets	0	1	0	0	0
Dots	0	1	0	0	0
Dum Dums	0	1	0	0	0
Fruit Chews	0	1	0	0	0
Fun Dip	0	1	0	0	0
Gobstopper	0	1	0	0	0
Haribo Gold Bears	0	1	0	0	0
Haribo Happy Cola	0	0	0	0	0
Haribo Sour Bears	0	1	0	0	0

Haribo Twin Snakes	0	1	0	0	0
Hershey's Kisses	1	0	0	0	0
Hershey's Krackel	1	0	0	0	0
Hershey's Milk Chocolate	1	0	0	0	0
Hershey's Special Dark	1	0	0	0	0
Jawbusters	0	1	0	0	0
Junior Mints	1	0	0	0	0
Kit Kat	1	0	0	0	0
Laffy Taffy	0	1	0	0	0
Lemonhead	0	1	0	0	0
Lifesavers big ring gummies	0	1	0	0	0
Peanut butter M&M's	1	0	0	1	0
M&M's	1	0	0	0	0
Mike & Ike	0	1	0	0	0
Milk Duds	1	0	1	0	0
Milky Way	1	0	1	0	1
Milky Way Midnight	1	0	1	0	1
Milky Way Simply Caramel	1	0	1	0	0
Mounds	1	0	0	0	0
Mr Good Bar	1	0	0	1	0
Nerds	0	1	0	0	0
Nestle Butterfinger	1	0	0	1	0
Nestle Crunch	1	0	0	0	0
Nik L Nip	0	1	0	0	0
Now & Later	0	1	0	0	0
Payday	0	0	0	1	1
Peanut M&Ms	1	0	0	1	0
Pixie Sticks	0	0	0	0	0
Pop Rocks	0	1	0	0	0
Red vines	0	1	0	0	0
Reese's Miniatures	1	0	0	1	0
Reese's Peanut Butter cup	1	0	0	1	0
Reese's pieces	1	0	0	1	0
Reese's stuffed with pieces	1	0	0	1	0
Ring pop	0	1	0	0	0
Rolo	1	0	1	0	0
Root Beer Barrels	0	0	0	0	0
Runts	0	1	0	0	0
Sixlets	1	0	0	0	0
Skittles original	0	1	0	0	0
Skittles wildberry	0	1	0	0	0
Nestle Smarties	1	0	0	0	0
Smarties candy	0	1	0	0	0

Snickers	1	0	1	1	1
Snickers Crisper	1	0	1	1	0
Sour Patch Kids	0	1	0	0	0
Sour Patch Tricksters	0	1	0	0	0
Starburst	0	1	0	0	0
Strawberry bon bons	0	1	0	0	0
Sugar Babies	0	0	1	0	0
Sugar Daddy	0	0	1	0	0
Super Bubble	0	1	0	0	0
Swedish Fish	0	1	0	0	0
Tootsie Pop	1	1	0	0	0
Tootsie Roll Juniors	1	0	0	0	0
Tootsie Roll Midgies	1	0	0	0	0
Tootsie Roll Snack Bars	1	0	0	0	0
Trolli Sour Bites	0	1	0	0	0
Twix	1	0	1	0	0
Twizzlers	0	1	0	0	0
Warheads	0	1	0	0	0
Welch's Fruit Snacks	0	1	0	0	0
Werther's Original Caramel	0	0	1	0	0
Whoppers	1	0	0	0	0

	crispedricewafer	hard	bar	pluribus	sugarpercent
100 Grand	1	0	1	0	0.732
3 Musketeers	0	0	1	0	0.604
One dime	0	0	0	0	0.011
One quarter	0	0	0	0	0.011
Air Heads	0	0	0	0	0.906
Almond Joy	0	0	1	0	0.465
Baby Ruth	0	0	1	0	0.604
Boston Baked Beans	0	0	0	1	0.313
Candy Corn	0	0	0	1	0.906
Caramel Apple Pops	0	0	0	0	0.604
Charleston Chew	0	0	1	0	0.604
Chewey Lemonhead Fruit Mix	0	0	0	1	0.732
Chiclets	0	0	0	1	0.046
Dots	0	0	0	1	0.732
Dum Dums	0	1	0	0	0.732
Fruit Chews	0	0	0	1	0.127
Fun Dip	0	1	0	0	0.732
Gobstopper	0	1	0	1	0.906
Haribo Gold Bears	0	0	0	1	0.465
Haribo Happy Cola	0	0	0	1	0.465
Haribo Sour Bears	0	0	0	1	0.465

Haribo Twin Snakes	0	0	0	1	0.465
Hershey's Kisses	0	0	0	1	0.127
Hershey's Krackel	1	0	1	0	0.430
Hershey's Milk Chocolate	0	0	1	0	0.430
Hershey's Special Dark	0	0	1	0	0.430
Jawbusters	0	1	0	1	0.093
Junior Mints	0	0	0	1	0.197
Kit Kat	1	0	1	0	0.313
Laffy Taffy	0	0	0	0	0.220
Lemonhead	0	1	0	0	0.046
Lifesavers big ring gummies	0	0	0	0	0.267
Peanut butter M&M's	0	0	0	1	0.825
M&M's	0	0	0	1	0.825
Mike & Ike	0	0	0	1	0.872
Milk Duds	0	0	0	1	0.302
Milky Way	0	0	1	0	0.604
Milky Way Midnight	0	0	1	0	0.732
Milky Way Simply Caramel	0	0	1	0	0.965
Mounds	0	0	1	0	0.313
Mr Good Bar	0	0	1	0	0.313
Nerds	0	1	0	1	0.848
Nestle Butterfinger	0	0	1	0	0.604
Nestle Crunch	1	0	1	0	0.313
Nik L Nip	0	0	0	1	0.197
Now & Later	0	0	0	1	0.220
Payday	0	0	1	0	0.465
Peanut M&Ms	0	0	0	1	0.593
Pixie Sticks	0	0	0	1	0.093
Pop Rocks	0	1	0	1	0.604
Red vines	0	0	0	1	0.581
Reese's Miniatures	0	0	0	0	0.034
Reese's Peanut Butter cup	0	0	0	0	0.720
Reese's pieces	0	0	0	1	0.406
Reese's stuffed with pieces	0	0	0	0	0.988
Ring pop	0	1	0	0	0.732
Rolo	0	0	0	1	0.860
Root Beer Barrels	0	1	0	1	0.732
Runts	0	1	0	1	0.872
Sixlets	0	0	0	1	0.220
Skittles original	0	0	0	1	0.941
Skittles wildberry	0	0	0	1	0.941
Nestle Smarties	0	0	0	1	0.267
Smarties candy	0	1	0	1	0.267

Snickers	0	0	1	0	0.546
Snickers Crisper	1	0	1	0	0.604
Sour Patch Kids	0	0	0	1	0.069
Sour Patch Tricksters	0	0	0	1	0.069
Starburst	0	0	0	1	0.151
Strawberry bon bons	0	1	0	1	0.569
Sugar Babies	0	0	0	1	0.965
Sugar Daddy	0	0	0	0	0.418
Super Bubble	0	0	0	0	0.162
Swedish Fish	0	0	0	1	0.604
Tootsie Pop	0	1	0	0	0.604
Tootsie Roll Juniors	0	0	0	0	0.313
Tootsie Roll Midgies	0	0	0	1	0.174
Tootsie Roll Snack Bars	0	0	1	0	0.465
Trolli Sour Bites	0	0	0	1	0.313
Twix	1	0	1	0	0.546
Twizzlers	0	0	0	0	0.220
Warheads	0	1	0	0	0.093
Welch's Fruit Snacks	0	0	0	1	0.313
Werther's Original Caramel	0	1	0	0	0.186
Whoppers	1	0	0	1	0.872

	pricepercent	winpercent
100 Grand	0.860	66.97173
3 Musketeers	0.511	67.60294
One dime	0.116	32.26109
One quarter	0.511	46.11650
Air Heads	0.511	52.34146
Almond Joy	0.767	50.34755
Baby Ruth	0.767	56.91455
Boston Baked Beans	0.511	23.41782
Candy Corn	0.325	38.01096
Caramel Apple Pops	0.325	34.51768
Charleston Chew	0.511	38.97504
Chewey Lemonhead Fruit Mix	0.511	36.01763
Chiclets	0.325	24.52499
Dots	0.511	42.27208
Dum Dums	0.034	39.46056
Fruit Chews	0.034	43.08892
Fun Dip	0.325	39.18550
Gobstopper	0.453	46.78335
Haribo Gold Bears	0.465	57.11974
Haribo Happy Cola	0.465	34.15896
Haribo Sour Bears	0.465	51.41243

Haribo Twin Snakes	0.465	42.17877
Hershey's Kisses	0.093	55.37545
Hershey's Krackel	0.918	62.28448
Hershey's Milk Chocolate	0.918	56.49050
Hershey's Special Dark	0.918	59.23612
Jawbusters	0.511	28.12744
Junior Mints	0.511	57.21925
Kit Kat	0.511	76.76860
Laffy Taffy	0.116	41.38956
Lemonhead	0.104	39.14106
Lifesavers big ring gummies	0.279	52.91139
Peanut butter M&M's	0.651	71.46505
M&M's	0.651	66.57458
Mike & Ike	0.325	46.41172
Milk Duds	0.511	55.06407
Milky Way	0.651	73.09956
Milky Way Midnight	0.441	60.80070
Milky Way Simply Caramel	0.860	64.35334
Mounds	0.860	47.82975
Mr Good Bar	0.918	54.52645
Nerds	0.325	55.35405
Nestle Butterfinger	0.767	70.73564
Nestle Crunch	0.767	66.47068
Nik L Nip	0.976	22.44534
Now & Later	0.325	39.44680
Payday	0.767	46.29660
Peanut M&Ms	0.651	69.48379
Pixie Sticks	0.023	37.72234
Pop Rocks	0.837	41.26551
Red vines	0.116	37.34852
Reese's Miniatures	0.279	81.86626
Reese's Peanut Butter cup	0.651	84.18029
Reese's pieces	0.651	73.43499
Reese's stuffed with pieces	0.651	72.88790
Ring pop	0.965	35.29076
Rolo	0.860	65.71629
Root Beer Barrels	0.069	29.70369
Runts	0.279	42.84914
Sixlets	0.081	34.72200
Skittles original	0.220	63.08514
Skittles wildberry	0.220	55.10370
Nestle Smarties	0.976	37.88719
Smarties candy	0.116	45.99583

```
Snickers                            0.651   76.67378
Snickers Crisper                    0.651   59.52925
Sour Patch Kids                     0.116   59.86400
Sour Patch Tricksters               0.116   52.82595
Starburst                           0.220   67.03763
Strawberry bon bons                 0.058   34.57899
Sugar Babies                        0.767   33.43755
Sugar Daddy                         0.325   32.23100
Super Bubble                        0.116   27.30386
Swedish Fish                        0.755   54.86111
Tootsie Pop                         0.325   48.98265
Tootsie Roll Juniors                0.511   43.06890
Tootsie Roll Midgies                0.011   45.73675
Tootsie Roll Snack Bars             0.325   49.65350
Trolli Sour Bites                   0.255   47.17323
Twix                                0.906   81.64291
Twizzlers                           0.116   45.46628
Warheads                            0.116   39.01190
Welch's Fruit Snacks                0.313   44.37552
Werther's Original Caramel          0.267   41.90431
Whoppers                            0.848   49.52411
```

Q1. How many different candy types are in this dataset?

```
nrow(candy)
```

```
[1] 85
```

Q2. How many fruity candy types are in the dataset?

```
sum(candy$fruity)
```

```
[1] 38
```

Data exploration

```
View(candy)
```

Q3. What is your favorite candy in the dataset and what is it's winpercent value?

```
candy["Werther's Original Caramel", ]$winpercent
```

```
[1] 41.90431
```

Q4. What is the winpercent value for "Kit Kat"?

```
candy["Kit Kat", ]$winpercent
```

```
[1] 76.7686
```

Q5. What is the winpercent value for "Tootsie Roll Snack Bars"?

```
candy["Tootsie Roll Snack Bars", ]$winpercent
```

```
[1] 49.6535
```

Q What is the least liked candy in the data set

```
x <- c(5, 3, 4, 1)
sort(x)
```

```
[1] 1 3 4 5
```

```
order(x)
```

```
[1] 4 2 3 1
```

```
inds <- order(candy$winpercent)
head(candy[inds,])
```

```
                  chocolate fruity caramel peanutyalmondy nougat
Nik L Nip                 0      1       0              0      0
Boston Baked Beans        0      0       0              1      0
Chiclets                  0      1       0              0      0
Super Bubble              0      1       0              0      0
Jawbusters                0      1       0              0      0
Root Beer Barrels         0      0       0              0      0
```

```
                    crispedricewafer hard bar pluribus sugarpercent pricepercent
Nik L Nip                          0    0   0        1        0.197        0.976
Boston Baked Beans                 0    0   0        1        0.313        0.511
Chiclets                           0    0   0        1        0.046        0.325
Super Bubble                       0    0   0        0        0.162        0.116
Jawbusters                         0    1   0        1        0.093        0.511
Root Beer Barrels                  0    1   0        1        0.732        0.069
                    winpercent
Nik L Nip             22.44534
Boston Baked Beans    23.41782
Chiclets              24.52499
Super Bubble          27.30386
Jawbusters            28.12744
Root Beer Barrels     29.70369
```

```
library("skimr")
skim(candy)
```

Table 1: Data summary

Name	candy
Number of rows	85
Number of columns	12
_____	
Column type frequency:	
numeric	12
_____	
Group variables	None

Variable type: numeric

skim_variable	n_missing	complete_rate	mean	sd	p0	p25	p50	p75	p100	hist
chocolate	0	1	0.44	0.50	0.00	0.00	0.00	1.00	1.00	
fruity	0	1	0.45	0.50	0.00	0.00	0.00	1.00	1.00	
caramel	0	1	0.16	0.37	0.00	0.00	0.00	0.00	1.00	
peanutyalmondy	0	1	0.16	0.37	0.00	0.00	0.00	0.00	1.00	
nougat	0	1	0.08	0.28	0.00	0.00	0.00	0.00	1.00	
crispedricewafer	0	1	0.08	0.28	0.00	0.00	0.00	0.00	1.00	
hard	0	1	0.18	0.38	0.00	0.00	0.00	0.00	1.00	
bar	0	1	0.25	0.43	0.00	0.00	0.00	0.00	1.00	

skim_variable	n_missing	complete_rate	mean	sd	p0	p25	p50	p75	p100	hist
pluribus	0	1	0.52	0.50	0.00	0.00	1.00	1.00	1.00	
sugarpercent	0	1	0.48	0.28	0.01	0.22	0.47	0.73	0.99	
pricepercent	0	1	0.47	0.29	0.01	0.26	0.47	0.65	0.98	
winpercent	0	1	50.32	14.71	22.45	39.14	47.83	59.86	84.18	

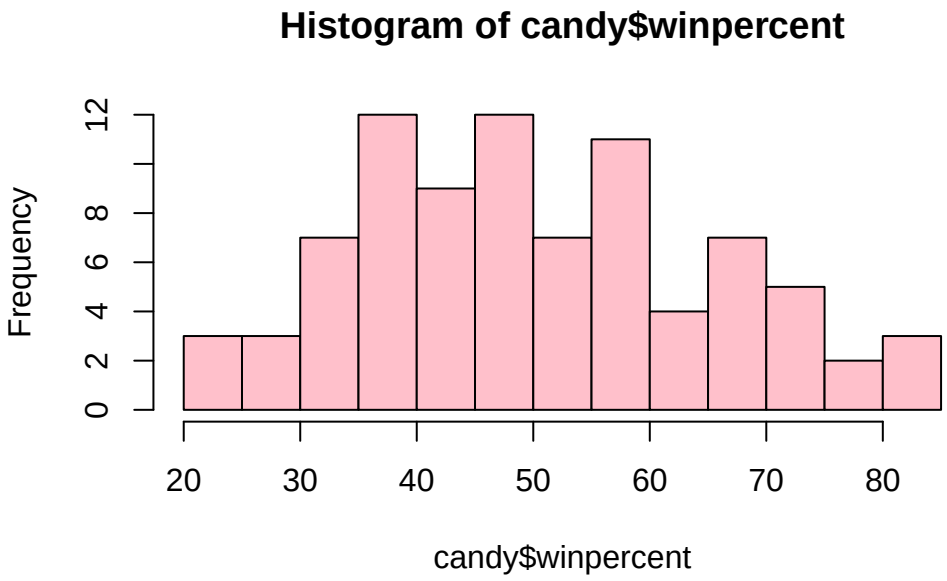
Q6. Is there any variable/column that looks to be on a different scale to the majority of the other columns in the dataset?

winpercent

Q7. What do you think a zero and one represent for the candy$chocolate column?

Q8. Plot a histogram of winpercent values

```
hist(candy$winpercent, col = "pink", breaks = 20)
```



Q9. Is the distribution of winpercent values symmetrical?

No it is no symmetrical it is skewed. The mean is below 50%.

Q10. Is the center of the distribution above or below 50%?

Below

Q11. On average is chocolate candy higher or lower ranked than fruit candy?

First find all chocolate candy and their $winpercent values

Next summarize these values into one number

The do the same to fruit candy and compare the numbers.

```
choc <- candy$winpercent[as.logical(candy$chocolate)]
summary(choc)
```

```
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max. 
  34.72   50.35   60.80   60.92   70.74   84.18 
```

```
fruit <- candy$winpercent[as.logical(candy$fruit)]
summary(fruit)
```

```
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max. 
  22.45   39.04   42.97   44.12   52.11   67.04 
```

On average chocolate is higher than fruity.

Q12. Is this difference statistically significant?

```
t.test(choc, fruit)
```

```

    Welch Two Sample t-test

data:  choc and fruit
t = 6.2582, df = 68.882, p-value = 2.871e-08
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 11.44563 22.15795
sample estimates:
mean of x mean of y 
 60.92153  44.11974 
```

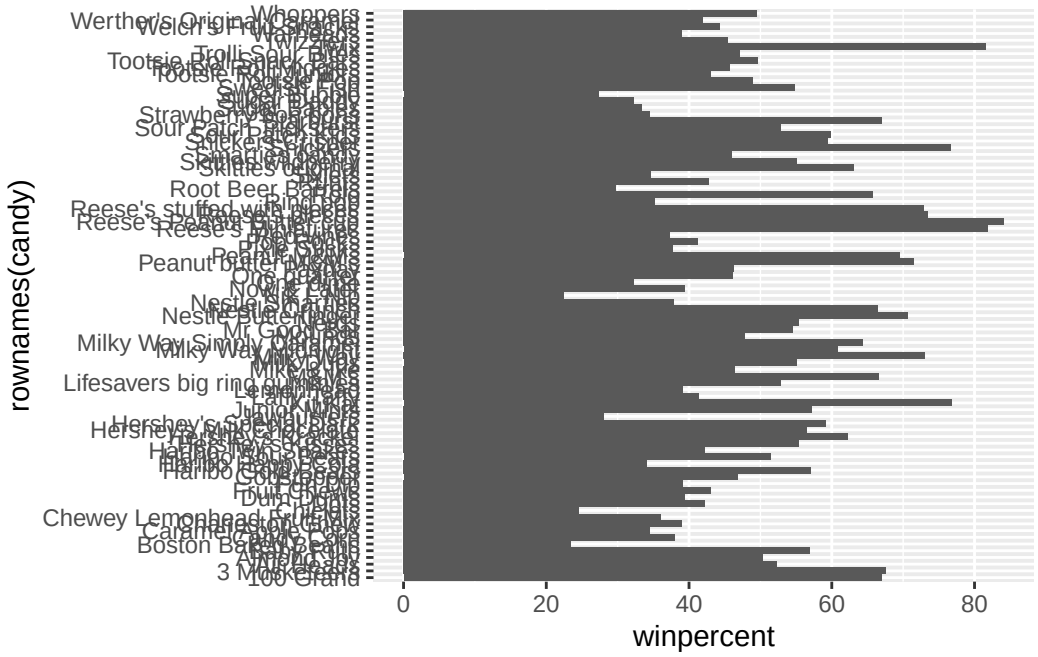
Overall Candy Rankings

Q13. What are the five least liked candy types in this set?

Q14. What are the top 5 all time favorite candy types out of this set?

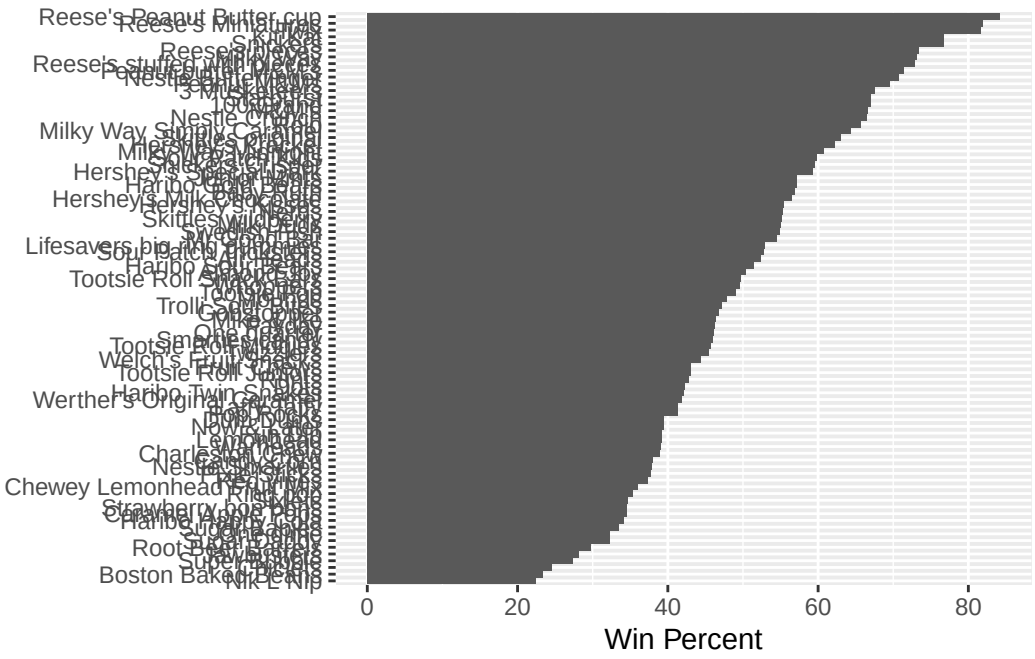
Q15. Make a first barplot of candy ranking based on winpercent values.

```
library(ggplot2)
ggplot(candy) +
  aes(winpercent, rownames(candy)) +
  geom_col()
```

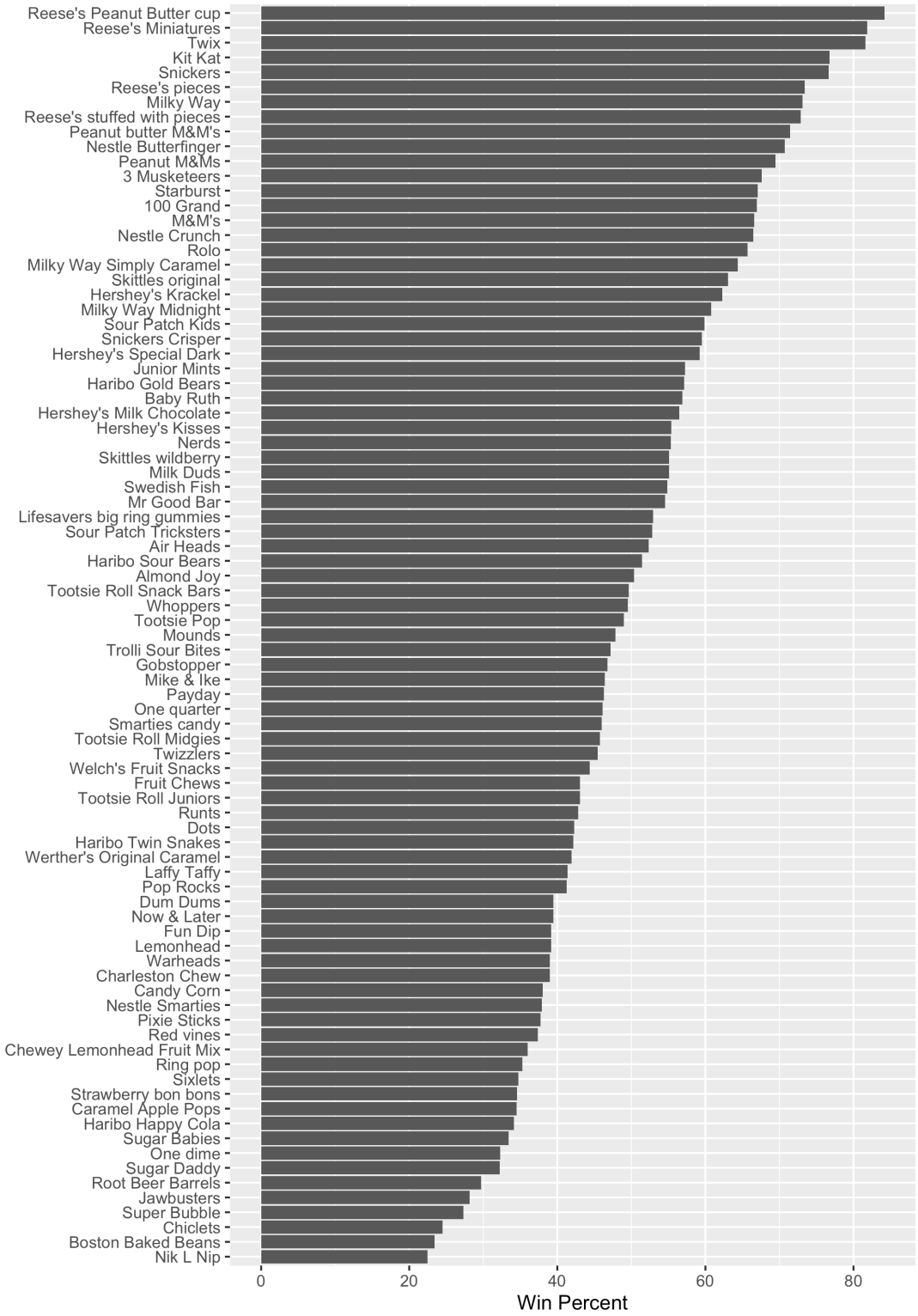


Q16. This is quite ugly, use the reorder() function to get the bars sorted by winpercent?

```
ggplot(candy) +
  aes(winpercent, reorder(rownames(candy),winpercent)) +
  geom_col() +
  labs(x = "Win Percent", y = NULL)
```



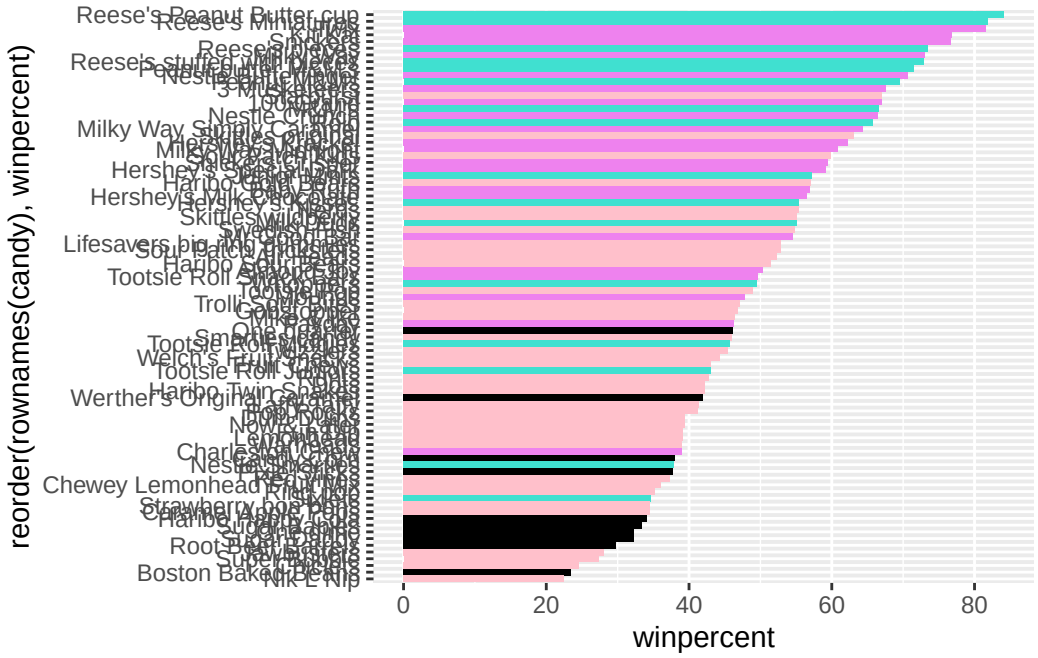

```
ggsave('barplot1.png', width = 7, height = 10)
```


Reese's Peanut Butter cup
Reese's Miniatures
Twix
Kit Kat
Snickers
Reese's pieces
Milky Way
Reese's stuffed with pieces
Peanut butter M&M's
Nestle Butterfinger
Peanut M&Ms
3 Musketeers
Starburst
100 Grand
M&M's
Nestle Crunch
Rolo
Milky Way Simply Caramel
Skittles original
Hershey's Krackel
Milky Way Midnight
Sour Patch Kids
Snickers Crisper
Hershey's Special Dark
Junior Mints
Haribo Gold Bears
Baby Ruth
Hershey's Milk Chocolate
Hershey's Kisses
Nerds
Skittles wildberry
Milk Duds
Swedish Fish
Mr Good Bar
Lifesavers big ring gummies
Sour Patch Tricksters
Air Heads
Haribo Sour Bears
Almond Joy
Tootsie Roll Snack Bars
Whoppers
Tootsie Pop
Mounds
Trolli Sour Bites
Gobstopper
Mike & Ike
Payday
One quarter
Smarties candy
Tootsie Roll Midgies
Twizzlers
Welch's Fruit Snacks
Fruit Chews
Tootsie Roll Juniors
Runts
Dots
Haribo Twin Snakes
Werther's Original Caramel
Laffy Taffy
Pop Rocks
Dum Dums
Now & Later
Fun Dip
Lemonhead
Warheads
Charleston Chew
Candy Corn
Nestle Smarties
Pixie Sticks
Red vines
Chewey Lemonhead Fruit Mix
Ring pop
Sixlets
Strawberry bon bons
Caramel Apple Pops
Haribo Happy Cola
Sugar Babies
One dime
Sugar Daddy
Root Beer Barrels
Jawbusters
Super Bubble
Chiclets
Boston Baked Beans
Nik L Nip
0
20
40
60
80
Win Percent

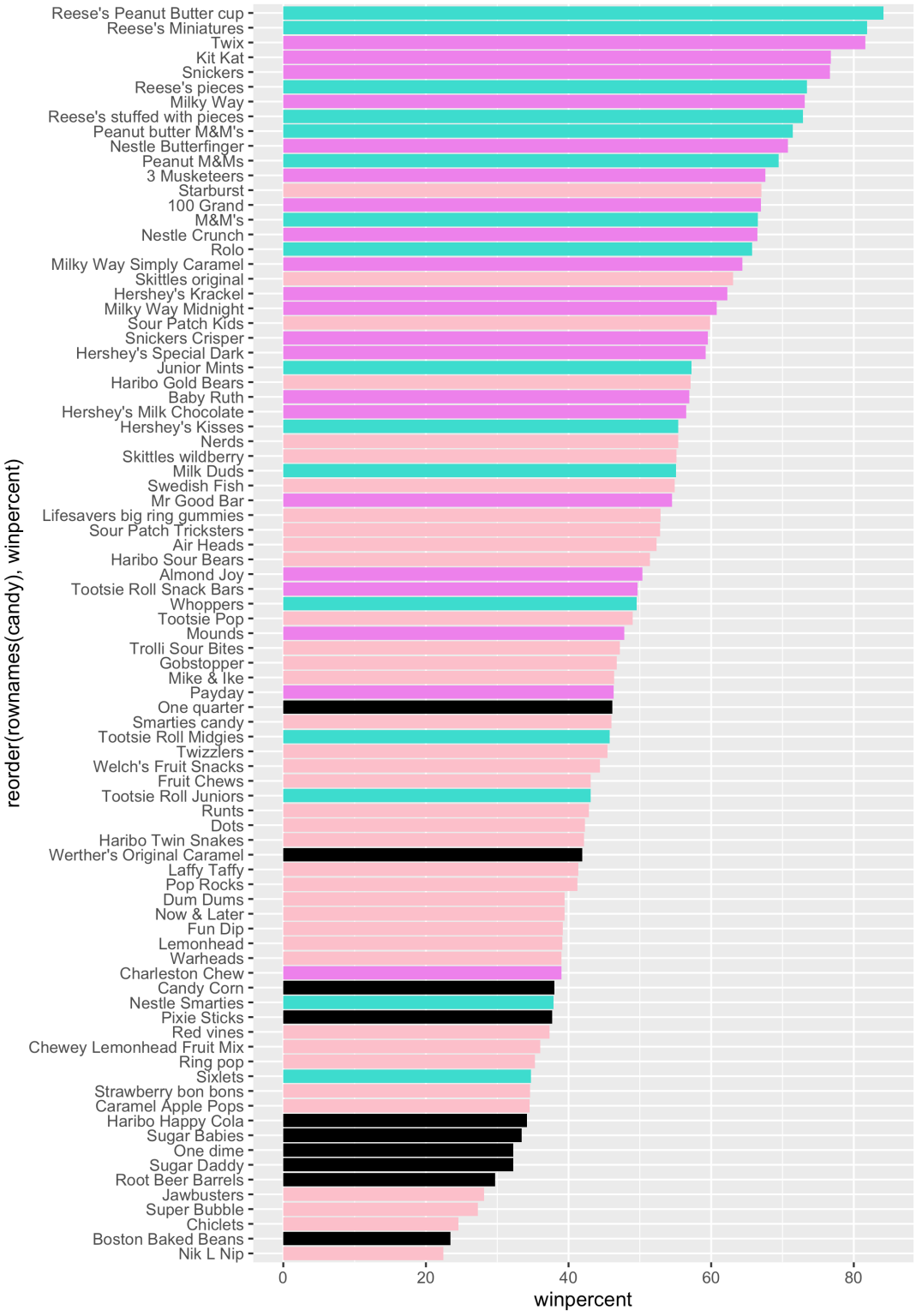
Pompompurin sticker:

```
my_cols=rep("black", nrow(candy))
my_cols[as.logical(candy$chocolate)] = "turquoise"
my_cols[as.logical(candy$bar)] = "violet"
my_cols[as.logical(candy$fruity)] = "pink"

ggplot(candy) +
  aes(winpercent, reorder(rownames(candy),winpercent)) +
  geom_col(fill=my_cols)
```




```
ggsave('barplot1color.png', width = 7, height = 10)
```


Reese's Peanut Butter cup
Reese's Miniatures
Twix
Kit Kat
Snickers
Reese's pieces
Milky Way
Reese's stuffed with pieces
Peanut butter M&M's
Nestle Butterfinger
Peanut M&Ms
3 Musketeers
Starburst
100 Grand
M&M's
Nestle Crunch
Rolo
Milky Way Simply Caramel
Skittles original
Hershey's Krackel
Milky Way Midnight
Sour Patch Kids
Snickers Crisper
Hershey's Special Dark
Junior Mints
Haribo Gold Bears
Baby Ruth
Hershey's Milk Chocolate
Hershey's Kisses
Nerds
Skittles wildberry
Milk Duds
Swedish Fish
Mr Good Bar
Lifesavers big ring gummies
Sour Patch Tricksters
Air Heads
Haribo Sour Bears
Almond Joy
Tootsie Roll Snack Bars
Whoppers
Tootsie Pop
Mounds
Trolli Sour Bites
Gobstopper
Mike & Ike
Payday
One quarter
Smarties candy
Tootsie Roll Midgies
Twizzlers
Welch's Fruit Snacks
Fruit Chews
Tootsie Roll Juniors
Runts
Dots
Haribo Twin Snakes
Werther's Original Caramel
Laffy Taffy
Pop Rocks
Dum Dums
Now & Later
Fun Dip
Lemonhead
Warheads
Charleston Chew
Candy Corn
Nestle Smarties
Pixie Sticks
Red vines
Chewey Lemonhead Fruit Mix
Ring pop
Sixlets
Strawberry bon bons
Caramel Apple Pops
Haribo Happy Cola
Sugar Babies
One dime
Sugar Daddy
Root Beer Barrels
Jawbusters
Super Bubble
Chiclets
Boston Baked Beans
Nik L Nip
reorder(rownames(candy), winpercent)
0
20
40
60
80
winpercent

Q17. What is the worst ranked chocolate candy?

Sixlets

Q18. What is the best ranked fruity candy?

Starburst

Taking a look at pricepercent

```
library(ggrepel)

# How about a plot of price vs win
ggplot(candy) +
  aes(winpercent, pricepercent, label=rownames(candy)) +
  geom_point(col=my_cols) +
  geom_text_repel(col=my_cols, size=3, max.overlaps = 4)
```

```
Warning: ggrepel: 72 unlabeled data points (too many overlaps). Consider
increasing max.overlaps
```

Q19. Which candy type is the highest ranked in terms of winpercent for the least money - i.e. offers the most bang for your buck?

Q20. What are the top 5 most expensive candy types in the dataset and of these which is the least popular?

```
ord <- order(candy$pricepercent, decreasing = TRUE)
head( candy[ord,c(11,12)], n=5 )
```

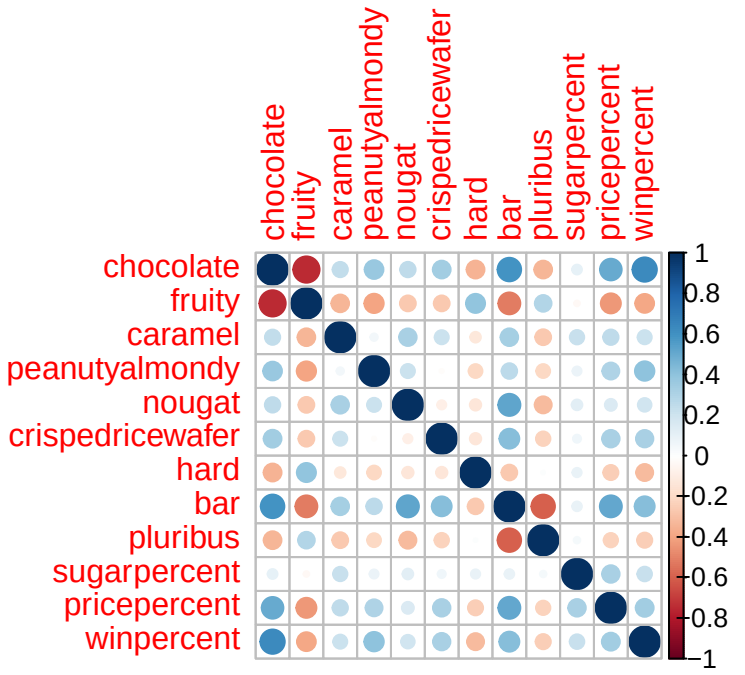
```
                        pricepercent winpercent
Nik L Nip                      0.976   22.44534
Nestle Smarties                0.976   37.88719
Ring pop                       0.965   35.29076
Hershey's Krackel              0.918   62.28448
Hershey's Milk Chocolate       0.918   56.49050
```

Exploring the correlation structure

```
library(corrplot)
```

```
corrplot 0.92 loaded
```

```
cij <- cor(candy)
corrplot(cij)
```



Q22. Examining this plot what two variables are anti-correlated (i.e. have minus values)?

Q23. Similarly, what two variables are most positively correlated?

On to PCA

The main function of this is `prcomp()` and here we know we need to scale our data with the `scale = T`

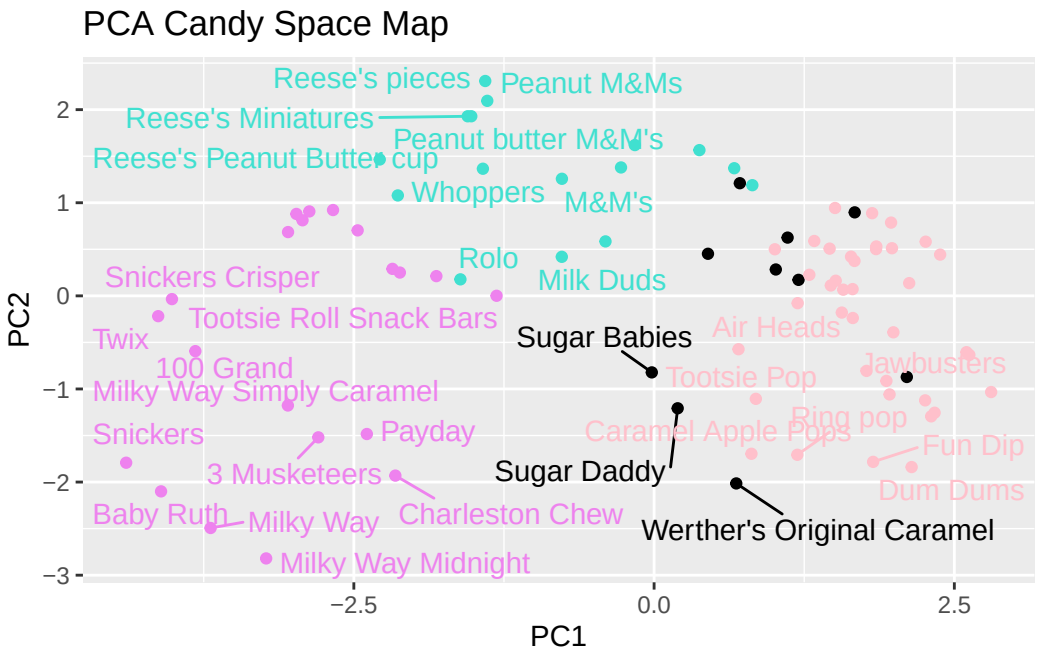
```
pca <- prcomp(candy, scale = TRUE)
summary(pca)
```

```
Importance of components:
                          PC1    PC2    PC3     PC4    PC5     PC6     PC7
Standard deviation     2.0788 1.1378 1.1092 1.07533 0.9518 0.81923 0.81530
Proportion of Variance 0.3601 0.1079 0.1025 0.09636 0.0755 0.05593 0.05539
Cumulative Proportion  0.3601 0.4680 0.5705 0.66688 0.7424 0.79830 0.85369
                           PC8     PC9    PC10    PC11    PC12
Standard deviation     0.74530 0.67824 0.62349 0.43974 0.39760
Proportion of Variance 0.04629 0.03833 0.03239 0.01611 0.01317
Cumulative Proportion  0.89998 0.93832 0.97071 0.98683 1.00000
```

```
my_data <- cbind(candy,pca$x[,1:3])
```

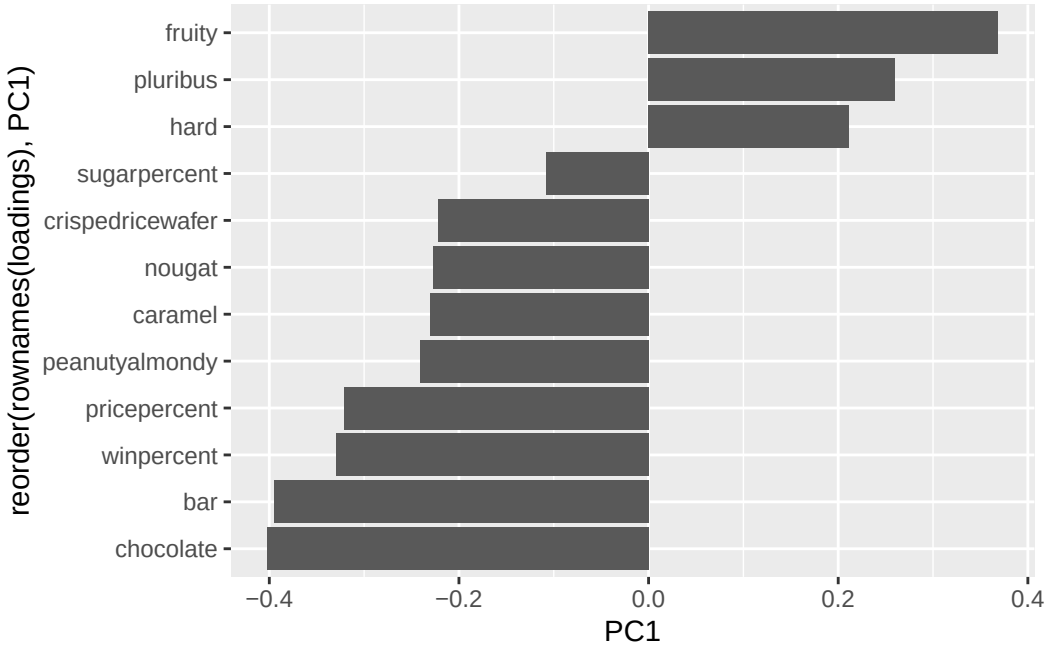
```
ggplot(my_data) +
  aes(PC1, PC2, label = rownames(candy)) +
  geom_point(col = my_cols) +
  geom_text_repel(col = my_cols) +
  labs(title = "PCA Candy Space Map")
```

```
Warning: ggrepel: 54 unlabeled data points (too many overlaps). Consider
increasing max.overlaps
```

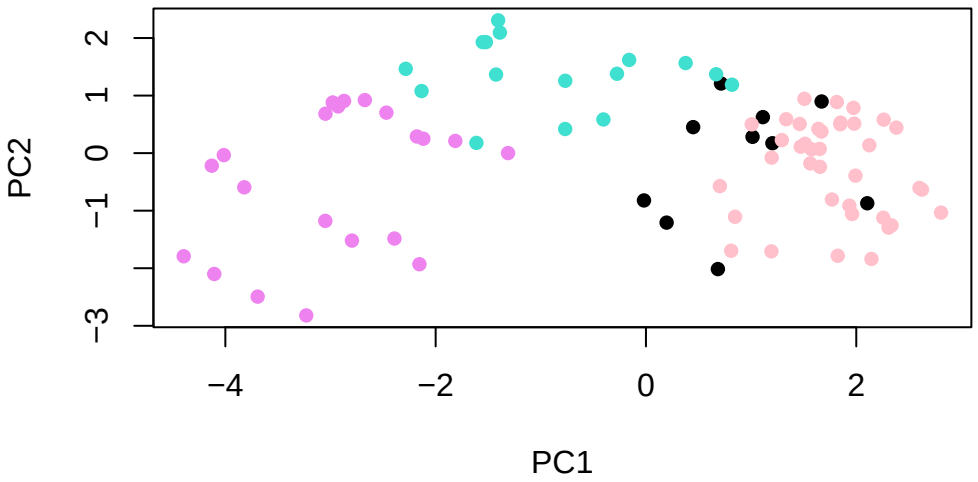



```
loadings <- as.data.frame(pca$rotation)

ggplot(loadings) +
  aes(PC1, reorder(rownames(loadings), PC1)) +
  geom_col()
```




```
plot(pca$x[,1:2], col=my_cols, pch=16)
```



```
p <- ggplot(my_data) +
        aes(x=PC1, y=PC2,
            size=winpercent/100,
            text=rownames(my_data),
            label=rownames(my_data)) +
        geom_point(col=my_cols)

p
```